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Working Pap

Factors Influencing Access to Agricultural Input Subsidy Coupons in Malawi

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Abstract

Since the 2005/06 agricultural season, the government of Malawi has been implementing a targeted agricultural input subsidy programme through the provision of fertilizers and maize seeds to smallholder farmers at subsidized prices. This paper analyses the factors that influence access to agricultural input subsidies in Malawi. The results show that vulnerable households such as the poor and elderly-headed are less likely to receive fertilizer coupons and receive less of the subsidized fertilizers. Households with larger parcels of land and those who sell part of their produce (commercialized) are more likely to receive coupons and also tend to acquire more fertilizers. Use of open meetings in the allocation of coupons tends to favour the poor and the poor receive more fertilizer compared with other alternative ways of allocating coupons. We also find a positive relation between participation in other social safety nets and access to subsidized fertilizer coupons, suggesting that households with multiple access to different types of social protection programmes are not excluded from the input subsidy programme by virtue of benefiting from other social protection programmes.

1. Introduction

The agricultural sector in Malawi is dominated by smallholder farmers mostly engaged in subsistence farming of the main staple crop, maize. Smallholder farmers devote almost 70 percent of their land to maize cultivation, and maize availability in the country defines the food security situation of the country. Smallholder agriculture in Malawi has been characterized by low productivity, low technology and labour intensity. The low productivity in smallholder agriculture has been attributed to loss in soil fertility, low application of inorganic fertilizers and traditional low technology rain-fed farming systems. Most of the smallholder farmers are resource-poor and cannot afford to purchase fertilizers at prevailing market prices. It is estimated that 52 percent of the population in Malawi lives below the poverty line, with rural poverty estimated at 55.9 percent (GOM and World Bank 2007). Prices of fertilizers have increased dramatically in recent years (Dorward et al. 2010), and this has created difficulties for rural farmers to acquire fertilizers at prevailing market prices. Smallholder fertilizer consumption in Malawi is low at about 34 kilograms per hectare compared to more than 150 kilograms in the estate sector (GOM and World Bank 2007).

In order to address some of the problems in agriculture and to raise the incomes of the resource poor, the Malawi Agricultural Input Subsidy Programme (MAISP) was first implemented in the 2005/06 agricultural season following a poor harvest season and a high maize import bill to augment domestic supply in 2004/05 agricultural season. In 2008/09, the MAISP was in its fourth year of implementation, with changes in the scale, scope and ways of implementation. The MAISP is largely financed by the government, with donor support being in form of overall budgetary support. The MAISP is designed as a targeted input subsidy programme, targeting smallholder farmers with land but who cannot afford to purchase inputs at market rates. The target is 2.8 million farming households identified by the Ministry of Agriculture and Food Security, out of an estimated 3.4 farming households. The size of the MAISP has increased from 132,000 tonnes in 2005/06 to 216,000 tonnes in 2007/08. This has also meant that the cost of the subsidy has escalated from MK5.1 billion (2.1 percent of GDP) in 2005/6 to MK16.3 billion (3.4 percent of GDP) in 2007/08 and to MK31 billion (5.5 percent of GDP) in 2008/09 (Dorward et al. 2010). The fertilizer subsidy per farmer increased from 64 percent to 79 percent of the commercial price in 2005/06 and 2007/08, respectively.

Due to the high poverty rate among the rural population, agricultural input subsidies apart from being an instrument of promoting agricultural growth can also be seen as a social protection instrument of ensuring access to inputs, and access and availability of food to vulnerable groups. Dorward et al. (2006) discuss the various strategic ways in which agriculture, agricultural policies and social protection programmes address the problems of vulnerable groups. Four strategic pathways are identified: social protection from agriculture and agricultural growth (such as service delivery, input subsidies and market intervention); social protection for agriculture (insurance, public works through created assets, inputs for work); social protection through agriculture (targeted inputs programmes); and social protection independent of agriculture (conditional or unconditional cash transfers, food aid). One direct way in which input subsidies can provide social protection to the poor is by targeting the poor or by implementing very high subsidies to ensure that the poor are able to access such inputs (Dorward et al. 2006). The input subsidy programme as a productivity enhancing intervention can also provide social protection to the poor and vulnerable households.

This paper investigates factors that determine household access to subsidized fertilizer coupons and how access to subsidy coupons complement other social protection programmes that focus on resource poor farmers. We test the hypothesis that the fertilizer subsidy programme targets the poor and vulnerable households, and hence that the programme offers direct social protection to such households. The paper is organized into five sections. The next section focuses on a brief overview of the design of the agricultural input subsidy programme focussing primarily on targeting and implementation experiences. Section 3 outlines the econometric model of determinants of access, definition of variables and the data used for the analysis. Section 4 presents the results of the econometric analysis and discussion of the results. Finally, section 5 presents concluding remarks.

2. Coupon Allocation and Targeting in the Malawi Agricultural Input Subsidy[2]

The agricultural input subsidy programme aims at promoting access and use of fertilizers among smallholder farmers in order to increase agricultural productivity and food security. According to GOM (2008b) the main objective of the agricultural input subsidy programme is to achieve household food self-sufficiency and increased income through increased food and cash crop production. In order to achieve these objectives, the target was defined as resource-poor Malawians who own a piece of land and are resident in the village, with special consideration to guardians looking after physically challenged persons and vulnerable groups such as child-headed, female-headed or orphan-headed households and households affected by HIV and AIDS (GOM 2008b). Although Dorward et al. (2010) note that the targeting criteria have explicitly placed more emphasis on vulnerable groups, in practice, there are difficulties in the application of these criteria, particularly due to the fact that the targeting criteria remained wide and that the criteria fitted large numbers of households against the available number of coupons allocated for the area.

The agricultural subsidy programme mainly focuses on the subsidization of maize fertilizers and improved maize seeds. However, the scope of coverage of crops under the subsidy programme had varied over time, and in addition to maize included tobacco, tea and coffee fertilizers, legume seeds, cotton seeds and chemicals and maize storage chemicals. The subsidy comes in various packages. Table 1 shows the various packages that have been used in various agricultural seasons by type of crops. A beneficiary household was entitled to either a maize package of fertilizers and seeds, a tobacco package of fertilizers, or a cotton package of chemicals and seeds. In addition, beneficiaries were also entitled to a flexible coupon to enable them purchase legume seeds, maize storage chemicals as well as improved maize seeds. In the 2008/09 season, due to substantial increases in the prices of fertilizers, the fertilizer subsidy also covered smallholder tea and coffee farmers[3]. Tobacco, tea and coffee are the main commercial and export crops in Malawi and there are arguments in favour of and against subsidizing cash crops. For example, those that argue in favour of subsidization of cash crops on one hand contend that subsidization allows greater commercialisation of smallholder farming, and increased incomes from these cash crops can be used to purchase food, particularly when the income increases are widespread among food insecure households. However, most smallholder farmers engaged in cash crops tend to be food secure and the benefits to vulnerable groups of such a policy are limited. On the other hand, those who argue against subsidization of cash crops note that subsidization of cash crops has the most displacement effects and resources therefore may not lead to incremental production necessary to maintain low food prices affordable to vulnerable people (SOAS et al. 2008).

The agricultural input subsidy as a targeted programme has a fixed number of vouchers that have to be distributed to smallholder farmers across the country. In the 2008/09 season, the subsidy was expected to benefit 1.5 million farmers for maize fertilizers, 0.2 million farmers for tobacco fertilizers, 1.9 million farmers for the maize seed subsidy, 0.435 million farmers for the flexible seed subsidy and 0.2 million farmers for cotton seed and chemicals. The total number of farming households was estimated at 3.2 million (GOM 2008a). In the 2008/09 season, there were three stages involved the targeting process: updating a register of all farm households, allocation of coupons to districts and within districts and local (village) processes of selecting beneficiaries.

First, the registration of farmers started in the 2007/08 season and this register was updated in the 2008/09 season between May and August 2008. The register

Table 1 Malawi Agricultural Subsidy Packages 2005/06 – 2008/09

Inputs/Crop	Maize	Tobacco	Cotton
Fertilizer	• 1 bag of 50 kilograms of NPK • 1 bag of 50 kilograms of UREA	• 1 bag 50 kilogram of CAN • 1 bag 50 kilogram of D. Compound	–
Seeds	• 4.5 kilograms of open pollinated varieties (OPV) maize seed • 2 kilograms of hybrid seed [a]	–	• 5 kilograms of acid delinted and treated cotton seed [b]
Chemicals	–	–	• 1 bottle of 50 millilitres of aphicide [b] • 2 bottles of 200 millilitres of larvicide [b]
Other seeds and chemicals	• Bean seed (2 kg) [b], groundnuts seed (2 kg) [b], soybean seeds (2-3 kg) [b] and pigeon peas seed (2 kg) b, 200 grams bottle of maize storage pesticide [c].		

Notes: [a] since 2006/07 season, [b] since 2007/08 season, [c] since 2008/09 season
Source: GOM (2008a; 2008b)

formed the basis of allocation of coupons to the districts and within the villages. Secondly, the allocation to districts and within the district is based on maize areas cultivated and number of farm households. Prior to 2007/08 season, there was no registration of farm families and local leaders identified households that benefited from the subsidy programme and the allocation to districts was based on crop (maize) areas under cultivation. Thirdly, the processes of identification of households have changed over time. In 2005/06 through to 2007/08, local leaders and local level Village Development Committees (VDC) were responsible for identifying beneficiaries, but agricultural staff managed the distribution of coupons in 2007/08 season. In 2008/09 season, an open system of identification of beneficiaries (community-based targeting) using the farming households register was introduced in allocation and distribution of coupons while the disbursement of coupons were led by the Ministry of Agriculture staff. There was greater involvement of other stakeholders in the facilitation of these processes including Ministry of Agriculture staff, religious leaders, VDC members, local government, police and civil society representatives.

Table 2 shows the extent to which open meetings were used in coupon allocation and distribution in the 2008/09 agricultural season across regions. It is evident that the open meeting system was used widely in both the allocation and distribution of fertilizer subsidy coupons.

Table 2. Extent of Use of Open Meeting in Allocation and Distribution of Fertilizer Subsidy 2008/09

Region	Allocation (% of sample)	Distribution (% of sample)
North	88	99
Central	71	97
South	88	95
Total	81	97

Source: Dorward et al. (2010)

About 81 percent and 96 percent of the households in the sample confirmed that open meetings in allocation and distribution of fertilizer subsidy coupons were held in their communities. The processes were therefore more open, particularly the distribution of fertilizer coupons. Dorward et al. (2010) note that due to the large number of eligible households relative to the number of coupons allocated to the villages, there was an informal system of re-distribution of coupons within the villages after the open meeting, with about 43 percent of the sample confirming that re-distribution took place in the villages.

Targeting is one of the critical elements of the effectiveness of the subsidy and in achieving efficiency in resource use. In an economy where the private marketing system in input markets is functioning, it is important to ensure that the subsidy does not displace commercial sales of fertilizers. In other words, the subsidized fertilizers should be targeted at households that could not have bought fertilizers at the prevailing market prices. Hence, the efficiency of a targeted programme depends on the extent to which errors of inclusion and exclusion can be minimized in the selection of beneficiaries.

According to Coady et al. (2002) errors of inclusion (leakage) occur when the non-poor or unintended households are included in the programme while errors of exclusion (undercoverage) occur when the poor or intended households are not included in the programme[4]. The problems of targeting social programmes are well-documented in the literature and include lack of information, high costs of acquiring information, and social stigma. The literature describes a number of alternative targeting methods in social programmes including using individual/household assessments based on socio-economic data, categorical targeting, self-selection and community-based targeting. These different methods have their own advantages and shortcomings (Morley and Coady 2003). Although more recently community-based targeting has been advocated as a participatory approach to identification of beneficiaries, as Morley and Coady (2003) note there is

Table 3 Mean Attributes of Households by Number of Fertilizer Subsidy Coupons Received, 2008/9

	Fertiliser Coupon numbers per hh					Sig.
	Zero	0.5 to 1	1.5 to 2	More than 2	All	
% hhold female headed	26%	31%	24%	17%	27%	*
Owned Area in ha	1.16	1.09	1.48	2.17	1.27	**
Value durable assets (MK)	19,621	15,630	20,340	28,111	18,702	
Value durable assets (MK)	18,689	22,947	41,807	58,946	28,699	*
Total Value livestock & durable assets (MK)	38,150	38,098	61,590	87,058	47,025	*
Subjective score of hh food consumption over past 12 months	1.5	1.5	1.6	1.7	1.5	*
Subjective score on welfare	2.3	2.2	2.5	2.8	2.3	**
Month after harvest that maize ran out	7.2	7.1	7.9	8.6	7.4	*

Source: Dorward et al. (2010) **Notes:** *= one or more differences significant at p=0.05, ** = one or more differences significant at 0.01

a danger of elite capture and variable interpretation of the programme beneficiary identification criteria. Dorward et al. (2010) and Chinsinga (2009), in the context of the input subsidy programme, note that the criteria for beneficiary identification remain wide and subject to different interpretations and communities tend to emphasise different vulnerable groups. Similarly, the 20-40 percent displacements of commercial fertilizer in the 2006/07 programme also suggest that households that could afford fertilizers at prevailing market prices were erroneously included in the programme (SOAS et al 2008).

Table 3 shows the characteristics of rural households by the number of coupons for subsidized fertilizer. Although since 2006/7, targeting criteria have placed more explicit emphasis on the provision of coupons to more vulnerable households, the evidence point to the fact that the poor and vulnerable groups are generally marginalized. The number of coupons received per household increases with land size, wealth (represented by value of assets and livestock), welfare and food security. The proportion of female-headed households decreases with the number of coupons received per household.

The difficulties in targeting vulnerable households arise from applying the prescribed targeting criteria. Dorward et al. (2010) note that fundamental difficulties in targeting therefore arise because of ambiguities, tensions and contradictions among different targeting criteria, related to difficulties in clearly establishing measures for applying these criteria, both of these being related to large numbers of households apparently deserving of coupons relative to the number of coupons available. As a result there are many variations in the characteristics of beneficiaries of fertilizer subsidy coupons, and the better off households tend to dominate the vulnerable households.

3. Econometric Model and Data

3.1 Model Specification and Data

Our econometric specification of the determinants of access to subsidized fertilizers uses two definitions of access. The first is receipt of fertilizer[5] coupons whether the household uses it or not to purchase subsidized fertilizers. SOAS et al (2008) estimated a similar model, however, their model focuses on access to subsidized fertilizers – those households that actually used their coupon allocations to purchase fertilizers. The second definition incorporates use of the coupons and measures access in terms of the amount of subsidized fertilizers acquired by the household (SOAS et al. 2008). We test the alternative definitions of access using the following empirical model: [6]

$$ASF_i = \alpha + \beta HC + \gamma FC + \kappa POV + \tau X + \varepsilon_i \qquad (1)$$

where for household i, ASF is access to or acquisition of subsidized fertilizers, HC is a vector of household characteristics including household composition and assets, FC is a vector of farming characteristics such as land sizes and commercial farming, POV is a vector of poverty and vulnerability variables, X is a vector of other control variables and ε is the error term. Access to subsidized fertilizer coupons is specified as a dichotomous variable representing receipt of fertilizer coupons, equation (1) is estimated using the probit model. Alternatively, where we use quantity of subsidized fertilizers acquired we estimate equation (1) using a tobit model.

We use data from the 2007/08 and 2008/09 evaluation of the MAISP collected from rural households drawn from all livelihood zones in the country, covering 14 of the 29 districts. The data contains information from 1,982 households. Most of the households are drawn from a panel of households sampled in the 2004/05 Integrated Household Survey, with the rest being replacement households. Although the agricultural input subsidy programme also covers maize and legume seeds and cotton chemicals, the analysis focuses on the fertilizer subsidy which is the largest component of the programme. The data captured information for both 2007/08 and 2008/09 seasons, and we explain access to 2008/09 subsidized fertilizers using 2007/08 characteristics representing an environment prior to the receipt of the subsidy in the reference agricultural season.

3.2 Definition of Variables

The dependent variables in the model are access to fertilizer coupons and quantity of subsidized fertilizers acquired by the household. Access to fertilizer coupons is defined as a dummy variable equal to 1 if at least one member of the household received a fertilizer voucher or coupon in the 2008/09 agricultural season. The quantity of subsidized fertilizers is the total amount of fertilizers in kilograms the household obtained using fertilizer coupons in the 2008/09 agricultural season. The acquisition of subsidized fertilizers using coupons implies use of the coupon to purchase fertilizers, although the farmer may not use all of the fertilizers in a particular season.

We group the explanatory variables into household characteristics, farmer characteristics, poverty and vulnerability variables and other control variables. The household characteristics in our model include age of household head, sex of household head, elderly headed households, household size, number of economically active members of the household and value of durable assets. The age of the household head is measured as number of years while the sex of the household head is represented by a dummy variable equal to 1 if the household head is male, otherwise equal to zero. Our hypothesis is that since female-headed households are singled out as one of the vulnerable groups in the criteria for targeting, we expect that female-headed households are more likely to access subsidized fertilizers. We also include elderly-headed households as one of the

vulnerable groups; defined as a dummy variable equal to 1 if the household head is above 65 years of age. Household size in terms of number of adult equivalents or the number of economically active members is included in the model to capture the effects of availability of family labour, which is important for agricultural activities in rural Malawi. The value of durable assets in 2008/09, measured in US dollars, represents the resource base, hence the wealth of the household. Since this indicates affordability, our expectation is that wealthier households are likely to redeem their fertilizer coupons, and are likely to be given priority on account of likely utilization of the subsidy. However, being resource-poor, low values of assets is the main criterion for identification of households and we therefore expect a negative relationship between wealth and access to subsidized fertilizers.

Farm characteristics variables include cultivated land in the 2008/09 season, cultivation of burley tobacco, selling maize in 2008/09 season, selling agricultural produce and acquisition of commercial fertilizers in 2007/08 season. Land cultivated in 2008/09 agricultural season is measured in hectares. Ownership of land is one of the main criteria for allocation of subsidy coupons in combination with resource constraints. Our expectation is that households with more land are more likely to have access to coupons compared to households with no land or small land sizes. Since 2005/06 season until the 2008/09 season, the fertilizer subsidy has also been covering smallholder burley tobacco growers. Ideally, cultivation of a cash crop should enable farmers to procure commercial fertilizers for both cash and food crop production, and access to subsidized fertilizers may potentially crowd-out commercial fertilizer sales. SOAS et al. (2008) find that displacement of commercial sales of fertilizers tends to be higher among tobacco farmers than among maize farmers. Marketing of maize by the household in 2008/09 is captured by a dummy equal to 1 if the household sold some maize. Households that sell maize are potentially net maize sellers and therefore food secure. We also test the role of commercial orientation of farmers, represented by participation in produce markets defined as a dummy variable equal to 1 if the household sold any agricultural output in 2008/09 season. Farmers that can afford purchase of fertilizers at prevailing market prices are unlikely to access subsidized fertilizers. To capture this aspect we include the quantity of commercial fertilizers acquired by the household in the previous season (2007/08). The higher the quantity of commercial fertilizer purchased the less resource-constrained the farmer and the more likely to be excluded in the allocation of the subsidy.

More recently, the targeting guidelines have emphasized recognition of vulnerable households. In this regard, our specification includes a vector of poverty and vulnerability variables which include self-assessed poverty status in the previous season, food consumption adequacy following the previous season's harvest, and participation in social safety net programmes. The first indicator of poverty and vulnerability is the own assessment of poverty in 2007/08 prior to receipt of fertilizer coupons. This is represented by a dummy variable equal to 1 if the household classified itself as poor in 2007.[7] It is expected that those households that reveal that they are poor are more likely to have access to subsidized inputs. The second indicator of vulnerability is the food security situation of the households. We represent this using a dummy variable equal to 1 if the household revealed that it had adequate or more than adequate food consumption in the past year of the survey (hence following the 2007/08 harvest). Since the programme objective is to achieve self-sufficiency in food, ceteris paribus, food insecure households are expected to have access to subsidized fertilizers. Participation in other social safety nets rather than input subsidies should also indicate vulnerability of households. Participation in other social safety net programmes is represented by a dummy variable equal to 1 if any member of the household participated in other social safety net programmes, otherwise equal to zero.[8] Alternatively, we include participation in public works programmes in which a dummy equal to 1 represents participation in public works programmes. Participation in other social safety nets may also be a potential factor in exclusion of vulnerable groups as the communities or implementers may feel that such households are already benefiting from social assistance.

We also introduce control variables in the model which include household's participation in the labour market, ownership of a business enterprise, receipt of remittances, receipt of subsidy coupons in the previous season (2007/08), coupon allocation system and regional dummies. Employment, business enterprise and remittances are indicators of household affordability of commercial fertilizers or ability to redeem vouchers. Participation in the labour market is represented by a dummy which is equal to 1 if any member of the household received income from salaried or *ganyu* employment in the previous season. Households that operate business enterprise, represented by a dummy equal to 1 if any member of the household operated a business enterprise in the 2007/08 season, are more likely to afford fertilizers at market prices. Similarly, receipt of remittances, represented by a dummy equal to 1, improves household ability to purchase commercial fertilizers. We include a dummy variable equal to 1 if the household received subsidy coupons in the previous agricultural season, 2007/08. Since 2007/08, the government introduced the system of registering farm households and an open forum for identification of beneficiaries and allocation of coupons to improve transparency and accountability. Previously, local politicians, traditional leaders and village committees were responsible for allocating coupons; a process which many farmers claimed was characterized by biases and favouritism (SOAS et al. 2008). The effect of the method of coupon allocation is captured by a dummy variable equal to 1 if poor households revealed that an open system of allocating coupons was used in their community. We expect that a more open and transparent system of coupon allocation is likely to favour the poor, hence a positive relationship between access and open forum and poverty.

4. Results and Discussions

4.1 Descriptive Statistics

Table 4 presents descriptive statistics of the variables used in the econometric analysis. The data show that about 70 percent of the sample households received a subsidized fertilizer coupon in the 2008/09 agricultural season. On average, households procured 53.6 kilograms of subsidized fertilizers using the voucher. The sample is also dominated by male-headed households accounting for 74 percent. We also note that about 16 percent of households are headed by the elderly. The sample is mainly rural and most of the households belong to the smallholder category as manifested by ownership of 1 hectare of land under cultivation in the 2008/09 agricultural season. Only 16 percent of households cultivated tobacco and only 33 percent were engaged in crop marketing following the 2008/09 harvest. The fertilizer subsidy focuses on maize that is produced to meet subsistence needs – the low proportion of households that engage in the sale of maize, only 10 percent, reflect the subsistence nature of maize. In 2007/08 season, only 28 percent of households purchased fertilizers at prevailing market prices, but this increased to 40 percent in the 2008/09 season. The prices of fertilizers in early 2007 increased substantially at the international market and consequently raised the domestic price of fertilizers in the 2007/08 agricultural season. Prices of fertilizers fell prior to the 2008/09 agricultural season, and it is not therefore surprising that there has been a 12 percent increase in the proportion of rural farmers that acquired commercial fertilizers. On average households purchased 43 kilograms of commercial fertilizers in 2007/08, but the amount of commercial fertilizer purchased in 2008/09 season only increased to 48 kilograms.

Most of the households ranked themselves as poor (87 percent) the 2007/08, but the proportion decreased to only 83 percent in the 2008/09 season. The self-assessment of poverty may be biased downwards given households' knowledge about the criteria for accessing the subsidy. However, using some indicator of food security, about 46 percent of households had adequate or more than adequate food consumption following the 2007/08 harvest, which implies that food poverty was about 54 percent. Only 15 percent of the households had access to social safety nets in 2007/08 (this increased to 17 percent in 2008/09). In 2007/08, 59 percent of the households had access to fertilizer coupons. We also note that a significant proportion of households participated in the labour market, operated a business enterprise and/

Table 4 Descriptive Statistics

Variables	Mean	SD	Min	Max
Access to fertilizer coupons in 2008/9 (0/1)	0.699	0.459	0.00	1.00
Quantity of subsidized fertilizers acquired 2008/9 (KG)	53.589	49.910	0.00	600.0
Age of household head (years)	47.133	16.063	18.00	99.00
Male headed household (0/1)	0.736	0.441	0.00	1.00
Elderly headed household (0/1)	0.155	0.362	0.00	1.00
Household size (adult equivalents)	4.714	2.109	0.00	16.98
Value of assets in US dollars in 2008/9	165.22	632.76	0.00	18064
Cultivated land in hectares in 2008/9	0.978	0.722	0.00	6.88
Tobacco cultivation in 2008/9 (0/1)	0.156	0.363	0.00	1.00
Crop marketing in 2008/9 (0/1)	0.330	0.471	0.00	1.00
Maize marketing in 2008/9 (0/1)	0.101	0.302	0.00	1.00
Quantity of commercial fertilizers bought in 2007/8 (KG)	43.02	230.43	0.00	6700
Own poverty assessment as poor in 2007/8 (0/1)	0.865	0.342	0.00	1.00
Adequate food consumption in 2008/9 (0/1)	0.462	0.499	0.00	1.00
Business enterprise in 2007/8 (0/1)	0.395	0.489	0.00	1.00
Labour market participation in 2007/8 (0/1)	0.497	0.500	0.00	1.00
Remittance receipts in 2007/8	0.392	0.488	0.00	1.00
Access to social safety nets in 2007/8 (0/1)	0.147	0.354	0.00	1.00
Access to fertilizer coupons in 2007/8 (0/1)	0.593	0.491	0.00	1.00
Open forum allocations 2008/9 and poor 2007/8 (0/1)	0.709	0.454	0.00	1.00
Northern region (0/1)	0.192	0.394	0.00	1.00
Central region (0/1)	0.363	0.481	0.00	1.00
Southern region (0/1)	0.446	0.497	0.00	1.00

Notes: (0/1) indicates dichotomous variable equal to 1 for the included category, otherwise equal to 0 for the base category.

or had received remittances in 2007/08, a season prior to receiving the fertilizer coupons for the 2008/09 season.

4.2 Econometric Results

Table 5 presents probit regression estimates of factors that determined access to subsidized fertilizer coupons in the 2008/09 agricultural season. We report the marginal effects of these factors on the probability of receiving a fertilizer subsidy coupon. Model 1 includes dummies for cultivation of burley tobacco and marketing of maize in the 2008/09 season and excludes the dummy for general agricultural produce marketing. Model 2 excludes tobacco cultivation and maize marketing, instead includes general crop marketing. The models explain about 26–27 percent of the variations as indicated by the Pseudo R^2. The Wald X^2 statistic shows that we reject the hypotheses that the marginal effects are equal to zero at the 1 percent significance level.

The household characteristics that are significant in explaining household's receipt of subsidized fertilizer coupons in both model specifications are age of household head, elderly headed households. With respect to age of household head, as the age of household heads increases such households are more likely to receive coupons and the probability of getting a coupon increases by 0.3 percent. However, households that are headed by the elderly (those above 64 years) are unlikely to receive fertilizer coupons and the probability falls by 13 percent. This is contrary to the emphasis on special vulnerable groups that has been placed recently in the targeting criteria for the subsidy programme. It may also be the case that elderly headed households are labour-constrained for farming activities and are least likely to use the coupons in farming.

All the variables representing farming characteristics are statistically significant at the 1 percent level. First, we find a positive relationship between probability of receiving a fertilizer coupon and size of land under

Table 5 Probit Estimates for Access to Fertilizer Coupons in 2008/09

Variables	Model 1		Model 2	
	dF/dx	*z*	*dF/dx*	*z*
Age of household head (years)	0.0032	3.11[a]	0.0027	2.54[b]
Male headed household (0/1)*	0.0021	0.08	-0.0032	-0.13
Elderly headed household (0/1)*	-0.1304	-2.75[a]	-0.1226	-2.44[b]
Household size (adult equivalents)	-0.0113	-2.02[b]	-0.0075	-0.89
Value of assets in US dollars in 2008/9	0.00001	-0.67	0.00001	-0.88
Cultivated land in hectares in 2008/9	0.0561	3.03[a]	0.0624	3.36[a]
Tobacco cultivation in 2008/9 (0/1)*	0.1720	5.29[a]	–	–
Maize marketing in 2008/9 (0/1)*	0.1126	3.22[a]	–	–
Crop marketing in 2008/9 (0/1)*	–	–	0.1011	4.27[a]
Quantity of commercial fertilizers bought in 2007/8 (KG)	-0.0002	-2.50[b]	-0.0001	-2.39[b]
Own poverty assessment as poor in 2007/8 (0/1)*	-0.0802	-2.19[b]	-0.0706	-1.88[c]
Adequate food consumption in 2008/9 (0/1)*	0.0202	0.91	0.0221	0.99
Business enterprise in 2007/8 (0/1)*	0.0051	0.23	0.0006	0.03
Labour market participation in 2007/8 (0/1)*	-0.0411	-1.83[c]	-0.0490	-2.17[b]
Remittance receipts in 2007/8 (0/1)*	0.0747	3.26[a]	0.0741	3.23[a]
Access to social safety nets in 2007/8 (0/1)*	0.0704	2.36[b]	0.0792	2.67[a]
Access to fertilizer coupons in 2007/8 (0/1)*	0.4460	20.21[a]	0.4515	20.46[a]
Open forum allocations 2008/9 and poor 2007/8 (0/1)*	0.0981	3.39[a]	0.0854	2.92[a]
Central region (0/1)*	-0.0367	-1.11	-0.0520	-1.55
Southern region (0/1)*	-0.0321	-0.99	-0.0432	-1.35
Number of observations	1982		1982	
Wald chi-squared (18)	517.51		518.39	
Prob > chi-squared	0.000		0.000	
Pseudo R-squared	0.2703		0.2582	

Notes: The dependent variable is a dummy variable for access to subsidized fertilizer coupons received in the 2008/09 agricultural season. (*) dF/dx (marginal effect) is for discrete change of dummy variable from 0 to 1. Robust t-statistics with superscripts a, b and c denote significance at the 1, 5 and 10 percent levels, respectively.

cultivation in both models. The results show that a unit increase in land increases the probability of receiving a coupon by 6 percent. The positive relationship is expected since land is one of the main criteria for targeting smallholder farmers. This finding is similar to the results in the 2006/07 study, in which a household with at least 3 hectares of land was 14 percent more likely to receive subsidized fertilizer (SOAS et al. 2008). Secondly, cultivation of tobacco, maize marketing and general produce marketing all increase the probability of receiving fertilizer coupons. Being a smallholder tobacco farmer increases the probability of receiving a fertilizer coupon by as much as 17 percent while those that produce a marketable maize surplus increase the probability of receiving the fertilizer coupons by 11 percent. Similarly, farmers that engage in commercial agriculture – those that sold some crops – are more likely to receive fertilizer coupons and increase the probability of receiving coupons by 10 percent. This implies that fertilizer coupons are likely to go to those smallholder farmers that earn cash incomes from agriculture with the potential to purchase fertilizers at prevailing market prices. Thirdly, we find that households that bought commercial fertilizers in the previous season are less likely to be allocated subsidized fertilizer coupons, and purchase of commercial fertilizers leads to a marginal 0.02 percent reduction in the probability. However, the marginal effect shows that the targeting is not good at excluding those who can afford commercial purchases.

Among the two poverty indicators, only the marginal effects of own assessment of poverty in 2007/08 is statistically significant at the 5 percent level in model 1 and 10 percent level of significance in model 2. The negative relationship between poverty and receipt of coupons shows that households that view themselves as poor are less likely to receive coupons. Poverty reduces the probability of receiving coupons by 8 percent. In the first two years of the subsidy, evidence of cash for coupon redemption was a pre-condition in some communities for households to receive fertilizer coupons (ICL et al. 2007 and SOAS et al. 2008). SOAS et al. (2008) find similar results on the effect of own poverty evaluation on the likelihood of receiving fertilizers, with wealthier households receiving more coupons than the poor households.

Four of the seven other control variables are important determinant of access to fertilizer vouchers. First, we find that participation in the labour market either through salaried or *ganyu* employment in the 2007/08 season reduced the household's chances of receiving coupons in the 2008/09 season.[9] The marginal effects of labour market participation are statistically significant at 10 percent and 5 percent level in model 1 and 2, respectively. Labour market participation in the previous season reduces the probability of receiving fertilizer coupons by about 5 percent. This implies that those in salaried employment are excluded as they are capable of purchasing fertilizers at commercial prices and those in *ganyu* employment maybe those households that do not have adequate land and use their labour resource in *ganyu* labour. Nonetheless, *ganyu* labour is the second most important source of cash for redeeming the coupons (SOAS et al. 2008 and Dorward et al. 2010). Secondly, there is a statistically significant positive relationship between remittances and probability of receiving coupons. Receipt of remittances in the previous season increases the probability of receiving coupons by 7.4 percent. Remittances are one of the sources of cash for redemption of coupons and purchase of farm inputs in the rural areas.

Thirdly, we find access to other social safety nets in the previous season to be positively associated with receipt of fertilizer coupons in the 2008/09 season. Participation in safety nets increases the probability of receipt of coupons by about 8 percent. This implies that participants in other social safety nets are not excluded from the fertilizer vouchers, and if safety nets are well targeted then they provide additional information about the vulnerable households in the communities. Some of the social safety nets such as cash-for-work or public works programmes if well coordinated can ease the cash constraint of vulnerable households and enable them to redeem the fertilizer coupons. Fourthly, the results suggest that households that benefited from the subsidy in the previous season were more likely to receive the coupons in the next season. The probability of receiving fertilizer coupons increases by 45 percent for households targeted in the previous season. Finally, it is interesting to note how important open forums for allocating coupons are for poor households. Dorward et al. (2010) and Chinsinga (2009) note that open meetings were used widely in allocation and distribution of coupons in the 2008/09 programme, particularly in the base allocation. Open forums for allocating coupons increase the chance of targeting those that ranked themselves in the poor category by about 10 percent. This suggests that community-based targeting may be superior to allocations that involve traditional leaders and committees as was previously the case in the 2005/06 up to the 2007/08 season.

We present tobit regression estimates of the factors associated with the quantity of subsidized fertilizers acquired by the households in 2008/09 season in Table 6. Although the explanatory power is low, the F-statistics suggest that we reject the null hypothesis that all the parameter estimates are equal to zero. In this model, household characteristics perform poorly, with only age of the household head being statistically significant at the 10 percent level in Model 1. In terms of farming characteristics, we find evidence of the positive relationship between quantity of subsidized fertilizers and land size, tobacco cultivation, maize marketing and general crop marketing, but no evidence of a significant relationship between subsidized fertilizers and commercial fertilizers. The coefficient of cultivated land is statistically significant at the 1 percent level in both models. A unit increase in hectares increases acquisition of subsidized fertilizers by about 13 kilograms. The coefficient of tobacco cultivation is also statistically significant at the 1 percent level, and cultivation of tobacco raises the amount of subsidized fertilizers by 28

Table 6 Tobit Estimates for Access to Subsidized Fertilizers in 2008/09

Variables	Model 1		Model 2	
	coeff.	*z*	*coeff.*	*z*
Age of household head (years)	0.227	1.69[c]	0.118	0.84
Male headed household (0/1)	1.698	0.49	0.921	0.26
Elderly headed household (0/1)	-7.940	-1.49	-4.926	-0.85
Household size (adult equivalents)	-1.172	-1.62	0.165	0.16
Value of assets in US dollars in 2008/9	-0.004	-1.09	-0.004	-1.29
Cultivated land in hectares in 2008/9	12.947	4.75[a]	13.679	5.15[a]
Tobacco cultivation in 2008/9 (0/1)	27.639	7.21[a]	–	–
Maize marketing in 2008/9 (0/1)	15.934	3.22[a]	–	–
Crop marketing in 2008/9 (0/1)	–	–	17.277	5.45[a]
Quantity of commercial fertilizers bought in 2007/8 (KG)	-0.014	-1.28	-0.010	-1.00
Own poverty assessment as poor in 2007/8 (0/1)	-15.299	-2.62[a]	-13.819	-2.37[b]
Adequate food consumption in 2008/9 (0/1)	6.501	2.23[b]	6.179	2.10[b]
Business enterprise in 2007/8 (0/1)	0.432	0.15	-0.389	-0.13
Labour market participation in 2007/8 (0/1)	-8.217	-2.85[a]	-9.297	-3.20[a]
Remittance receipts in 2007/8 (0/1)	5.049	1.63	4.486	1.44
Access to social safety nets in 2007/8 (0/1)	4.666	1.40	5.906	1.79[c]
Access to fertilizer coupons in 2007/8 (0/1)	56.109	15.82[a]	57.306	16.19[c]
Open forum allocations 2008/9 and poor 2007/8 (0/1)	13.167	3.36[a]	11.489	2.89[a]
Central region (0/1)	-24.973	-6.35[a]	-28.354	-6.97[a]
Southern region (0/1)	-18.023	-4.51[a]	-20.761	-5.20[a]
Constant	3.257	0.35	4.675	0.50
Number of observations	1982		1982	
F (18, 1963)	27		26.3	
Prob > F	0.000		0.000	
Pseudo R-squared	0.0406		0.0388	

Notes: The dependent variable is quantity of subsidized fertilizer acquired in the 2008/09 agricultural season. Robust t-statistics with superscripts a, b and c denotes significance at the 1, 5 and 10 percent levels, respectively.

kilograms. This implies that on average tobacco farmers received more fertilizers than non-tobacco farmers. Although the policy is one package per household, it appears that tobacco farmers may also have received subsidized fertilizers for maize. Similar to the probit results, households that sold some maize or those that participated in general agricultural produce marketing tended to have acquired more subsidized fertilizers, with the coefficients being statistically significant at the 1 percent level. We find no statistically significant relationship between quantity of commercial fertilizers and the amount of subsidized fertilizers, suggesting that the programme also targets households that can afford commercial fertilizers leading to displacement of commercial sales.

There is a significant negative relationship between poverty and the quantity of subsidized fertilizers received by the households. Households that rank themselves in the poor category are likely to receive about 15 kilograms less than households in the non-poor category. There is a tendency for the subsidized fertilizers to reach the better-off farmers. This result is reinforced by the significant positive relationship between adequacy in food consumption and amount of subsidized fertilizers. Households that are food secure tend to receive 7 kilograms more subsidized fertilizers than food insecure households.

The coefficient of participation in the labour market is negative and statistically significant at the 1 percent level in both models. The results show that households that had some employment received about 9 kilograms less of subsidized fertilizers than households that did not participate in the labour market. Hence, the targeting generally tends to exclude those that are wage earners. Remittances and business enterprise do not seem to influence the amount of subsidized fertilizers received by the household, while access to social safety nets weakly influences the amount of subsidized fertilizers. The impact of access to subsidized fertilizer in the previous season on the amount of subsidized fertilizer

in the 2008/09 season is statistically significant at the 1 percent level in both models. Households that are successively receiving subsidized fertilizers receive 56 kilograms (just more than a 50 kg bag) more that households that only received fertilizers in the 2008/09 season. Transparency in coupon allocation also tends to favour the poor with the coefficient of the interaction of open forum and poverty being positive and statistically significant at the 1 percent level. We also find that the central and southern regions also tend to receive about 28 kilograms and 20 kilograms per household less than the northern region.

5. Conclusions

The paper set out to investigate factors that facilitate access to subsidized fertilizer coupons in Malawi. Since 2005/06 season, the Malawi Government has been implementing an agricultural input subsidy programme targeting smallholder farmers in order to improve productivity and food security. As a productivity enhancing programme, the input subsidy programme also plays a social protection role among the poor and vulnerable household by making food accessible and available, and directly by targeting vulnerable groups. The agricultural input subsidy programme targets smallholder farmers who are resource-poor but own a piece of land. The targeting criteria also recognizes special vulnerable groups as targets such as guardians looking after physically challenged persons, child-headed, female-headed and orphan-headed households and households infected or affected with HIV and AIDS. There are contradictions in the targeting criteria in reaching out to vulnerable groups. Nonetheless, the targeting criteria remain wide and there are variations in the use of the targeting guidelines in different communities particularly since the number of needy households tends to be much larger than the available number of fertilizer coupons.

The main focus of the subsidy is on fertilizers for maize production and improved maize seed varieties, although over the years there has been inclusion of cash crops such as tobacco, tea, coffee and cotton. The fertilizer subsidy benefited 1.5 million maize farmers and 0.2 million tobacco farmers in the 2008/09 agricultural season; more than half of the estimated number of farming households. The fertilizer coupons were allocated based on an updated register of farmers, and for most households the identification of beneficiary households and subsequent allocation of coupons were done in an open meeting.

Since the target group for the fertilizer subsidy programme includes the poor and vulnerable groups, apart from productivity enhancement, the subsidy may also provide social protection to vulnerable groups. Several findings emerge from the study with implications on targeting of the input subsidy programme. First, the study finds that although the poor and vulnerable households are also allocated subsidized fertilizer coupons, they are less likely and receive less than the better off smallholder farmers that have larger parcels of land and wealthier. Elderly-headed households and the poor are less likely to access subsidized fertilizer coupons while households with larger parcels of land and those that market part of their produce are more likely to receive subsidized fertilizer coupons. The programme, however, succeeds in excluding households that earn incomes from the labour market, particularly those that earn income from non-*ganyu* labour. There is a weak relationship between access to coupons and quantity of fertilizers from commercial purchases, implying that the problems of targeting result in some displacement of commercial sales of fertilizers.

Secondly, participation in other social safety nets in the past does not exclude households from the input subsidy programme. The beneficiaries of other social safety nets are more likely to access subsidized fertilizer coupons, hence there are complementarities among social safety nets. Some of the social safety nets that target the poor and vulnerable households, such as cash-for-work or public works programmes, ease the cash constraint of vulnerable households and enable them to redeem the fertilizer coupons. In addition, if other social safety nets are well targeted at the vulnerable groups, it implies that participation in such programmes provide additional information on vulnerability in targeting the input subsidy programme. Finally, openness in the implementation of the input subsidy programme is pro-poor. The introduction of the open forums in the allocation of subsidized fertilizer coupons tends to raise the likelihood of the poor, who are generally marginalized, to access subsidized fertilizer coupons and to acquire more subsidized fertilizers than when the process is not transparent.

The results therefore suggest that for the subsidy programme to effectively perform its direct social protection role there is a need to review the targeting criteria so that they recognize the vulnerable groups as the main target group provided such households have cultivatable land. For instance, using a point system on the existing criteria has the potential to increase access to subsidized fertilizers to the vulnerable groups. While possession of land should be the basic condition for access to fertilizer coupons, households should gain additional targeting points if they also qualify as vulnerable households as defined by the existing criteria. For instance, an elderly female-headed household would get two additional targeting points while an elderly male-headed household would only get one additional targeting point. Households with land and high targeting points should be prioritized in the allocation of coupons using an open forum held in the community. Furthermore, there is also a need to enhance the complementarity of the input subsidy programme and cash-for-work programmes through increased coordination, particularly to enable vulnerable groups to access cash for the redemption of subsidized fertilizer coupons.

End Notes

This paper is an output of the Future Agricultures Consortium (FAC) in the thematic area of Agricultural Growth and Social Protection. The usual disclaimer applies.

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1 Dorward et al. (2009) discuss these in the context of post-Independence agricultural policies in Malawi.

2 This section draws on Dorward and Chirwa (2009) and Dorward et al. (2010).

3 The inclusion of cash crops such as coffee and tea was more politically motivated; 2009 being an election year smallholder tea and coffee farmers lobbied during the year to benefit from the subsidy programme on grounds of the substantial increase in the cost of fertilizers (Dorward et al. 2010).

4 These errors are also known as E-mistakes (excessive coverage) and F-mistakes (failure to reach intended beneficiaries), respectively (Cornia and Stewart 1995). See Coady and Skoufias (2001) for alternative interpretations.

5 There are several factors that lead to farmers' inability to redeem the vouchers including lack of money to redeem the coupons, unavailability of inputs, availability of inappropriate types of fertilizers and late distribution of vouchers particularly supplementary allocations (SOAS et al. 2008). However, only 1.2 percent of households in the sample were unable to redeem their fertilizer coupons.

6 The models are similar to those used in SOAS et al. (2008). However, the major departure in this paper is that we use mostly variables derived from the previous season (2007/07) to predict receipt of fertilizer vouchers in the current season (2008/09).

7 The self-assessment of poverty involves the households' perception of their own poverty using a six step ladder ranging from 1 (very poor) to 6 (very rich). The poor are those with the ladder values from 1 to 3.

8 These social safety nets include free food distribution, food or cash for work programmes, targeted nutrition programmes, supplementary feeding programmes and direct cash transfers implemented by government and non-governmental organisations.

9 We also estimated the models with *ganyu* employment in 2007/08 instead of participation in the labour market in general. Although, the marginal effect remained negative, the coefficient was statistically insignificant. This suggests that the labour market participation and access to subsidy coupons is more driven by non-*ganyu* labour participation.

References

Chinsinga, B. (2009) 'Participation of Civil Society in the Monitoring of the Agricultural Input Subsidy Programme (AISP)', report presented to the Consortium of FUM, CISANET and MEJN. Lilongwe, Malawi: FUM, CISANET and MEJN.

Coady, D. and Skoufias, E. (2001) On the Targeting and Redistributive Efficiencies of Alternative Transfer Instruments. FCND Discussion Paper 100, Washington, D.C., USA: International Food Policy Research Institute.

Coady, D., Grosh, M. and Hoddinott, J. (2002) Targeting Outcomes Redux. FCND Discussion Paper 144, Washington, D.C., USA: International Food Policy Research Institute.

Cornia, G. A. and Stewart, F. (1995) 'Food Subsidies: Two Errors of Targeting', in Stewart, F. (ed), Adjustment and Poverty: Options and Choices, London and New York: Routledge.

Dorward, A. and Chirwa, E. (2009) 'The Agricultural Input Subsidy Programme 2005 to 2008: Achievements and Challenges', paper presented to the Government of Malawi and DFID, Lilongwe, Malawi: Malawi Government and DFID (Malawi).

Dorward, A., Chirwa, E. and Slater, R. (2010) 'Evaluation of the 2008/09 Agricultural Input Subsidy Programme, Malawi: Report on Programme Implementation', report presented to the Government of Malawi and DFID, Lilongwe, Malawi: Malawi Government and DFID (Malawi).

Dorward, A., Guenther, B. and Sabates-Wheeler, R. (2009) Agriculture and Social Protection in Malawi. FAC Working Paper No. SP02, Brighton, UK: Future Agricultures Consortium.

Dorward, A., Sabates-Wheeler, R., MacAuslan, I., Buckley, C. P., Kydd, J. and Chirwa, E. (2006) Promoting Agriculture for Social Protection or Social Protection for Agriculture: Strategic Policy and Research Issues. FAC Discussion Paper, Brighton, UK: Future Agricultures Consortium.

GOM (2008a) 'The 2007/2008 Inputs Subsidy Programme Review Report', Lilongwe, Malawi: Ministry of Agriculture and Food Security, Government of Malawi.

GOM (2008b) 'The 2008/2009 Farm Inputs Subsidy Programme: Implementation Guidelines', Lilongwe, Malawi: Ministry of Agriculture and Food Security, Government of Malawi.

GOM and World Bank (2007) Malawi – Poverty and Vulnerability Assessment: Investing in Our Future, Washington, D.C., USA: The World Bank and Government of Malawi.

ICL (Imperial College of London), Wadonda Consult, Michigan State University and Overseas Development Institute (2007) 'Evaluation of the 2006/7 Agricultural Input Supply Programme, Malawi', report presented to the Government of Malawi and DFID, Lilongwe, Malawi: Malawi Government and DFID (Malawi).

Morley, S. and Coady, D. (2003) From Social Assistance to Social Development: Targeted Education Subsidies in Developing Countries. Washington, D.C., USA: Center for Global Development and International Food Policy Research Institute.

SOAS (School of Oriental and African Studies), Wadonda Consult, Michigan State University and Overseas Development Institute (2008) 'Evaluation of the 2006/7 Agricultural Input Supply Programme, Malawi', report presented to the Government of Malawi and DFID, Lilongwe, Malawi: Malawi Government and DFID (Malawi).

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